is more marked above the umbilicus, whereas in this case the abdominal swelling was more marked below the umbilicus, owing to the distension of the colon. No pancreatic tumour was felt, owing perhaps to the difficulty of palpation due to the general tenderness of the abdomen. The only symptom which seems now to have pointed strongly to pancreatic inflammation was the constancy of the tender point 1 in. above the umbilicus. A perforated gastric ulcer might have caused this, but in this case the liver dullness was always present, and neither the appearance of the patient nor the abdomen was at all suggestive of this latter condition, for the abdominal wall, though tender, was not rigid, and the distension was very slow in becoming marked, making the clinical picture more one of intestinal obstruction than peritonitis. I do not think this case would have required the second operation for the pancreatic abscess if I had made a deeper incision in the pancreas; as it was, the drainage tube must have lifted away just enough to prevent free drainage.

On October 19th, 1908, I saw this patient again, and she was in good health and felt quite strong, but is troubled with a small fistula leading from the gall bladder out of which a small quantity of mucus issues. At date of writing, November 16th, 1908, the patient is quite well, and the fistula has been healed for about three weeks.

ARROWS AND ARROW WOUNDS IN NORTHERN NIGERIA.

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THE weapon of war most generally used among pagan races of Northern Nigeria is the bow and arrow; even the more civilized races, who fight on horseback with spear or sword, generally include a strong company of archers among their forces. The arrow is also used in the chase, and is then, as far as one can learn, anointed with the same poisonous substances that are prepared for human quarry. Native big game hunters, who may have access to gunpowder, fire their arrows (which are much stouter than the ordinary bow arrow) out of Dane guns at close quarters; the hunter in this case is often the first to fall! There seems to be no objection among the natives to eating the flesh of game killed by these weapons. The arrow consists usually of a simple barb made from local iron mounted on a shaft of stout reed, the whole measuring about 2 ft. in length. They are usually very neatly made, and as many as thirty or forty arrows can be carried in one quiver. A winged arrow is practically unknown, but this is explained by the fact that the arrow is not meant to kill, but is simply a poison carrier: consequently they are generally discharged at close range, though instances are on record of men being hit at ranges varying from 150 to 200 yards.

Usually the first intimation that hostilities have commenced is a shower of arrows shot into the air, but there is no doubt in the bowmen's mind as to where they are to fall, and a few generally find their billet. Other tribes, especially hill pagans, adopt other tactics and go in for sniping at close quarters—a most unpleasant experience for those sniped at.

The bow apparently does not come in for nearly the same amount of care in its manufacture as do the arrows, though it seems to fulfil its purpose quite well.

There is great difficulty in extracting from the natives any reliable information as to the composition of their poisons, and there seems to be a different recipe for each district. Evidence is accumulating to show that in nearly all the Northern Nigerian poisons some form of strophanthus plays a part. The composition of the poisons, however, is never simple, but consists of various animal and vegetable ingredients which may have a local reputation for being nocuous. Thus the inspissated juice of various cacti and euphorbiae is a favourite ingredient with hillsmen, while the roots, leaves, and fruit of other wild plants are often incorporated.

Animal secretions in a state of decomposition are said to be used by some of the more savage tribes. The people in one district are credited with the manufacture of a poison so deadly that only the very aged and feeble are allowed to make it. Others, again, adopt the simple method of using a decomposing carcass as a sort of pincushion for infecting their arrows. Finally, there would appear to be districts where the tetanus bacillus abounds, and arrows are rendered poisonous by merely planting them head downwards in the soil.

The native is particularly reticent (and often cunningly misleading) about a matter that affects him so closely, but the results of sending home all available specimens of poisons is encouraging. The poison paste, as seen on the arrow heads, has a dark and often varnished appearance; it is partly soluble in water, a resin-like substance being frequently precipitated. In all probability old paste loses most of its poisonous properties; injections into animals with old material generally produce no result. It would seem that the natives themselves realize this fact, for they generally "brew" a fresh supply of poison before starting on any raiding expedition, or in anticipation of a visit from the white man and his troops. On more than one occasion I have noticed that the marksmen are accompanied by poison bearers, who carry the poison in a fresh and liquid state enclosed in small gourds. The bowman then inoculates each arrow as required by dipping it into the poison cup.

Nearly all the samples of arrow poisons from Northern Nigeria that have been sent to the Imperial Institute for analysis have been found to contain strophanthus and strychnine, besides several other substances physiologically unimportant. Both poisons are derived from plants growing locally.

The injuries from arrows range in severity from a mere skin scratch to the transfixion and laceration of some deeply placed organ; and the seriousness or otherwise of such wounds depends upon the part of the body hit and the character of the poison used. As far as my observations go, the individual powers of resistance on the part of the patient need not be considered, as the troops sent on an expedition are all picked men in sound health. The temperament and fatalistic tendencies of the native soldier, however, should always be remembered, as these factors certainly affect the prognosis.

The range at which an arrow is fired greatly affects, of course, the degree of its penetration, and the resulting wounds are proportionately serious. A deep artery may be wounded, or fatal haemorrhage may occur from the transfixion and laceration of some internal organ. I have come to believe, too, that the toxic effects of a poisoned arrow are enhanced by the depth of the wound it causes. In the first place, the poison is more easily rubbed off under such circumstances; secondly, the arrow head must necessarily remain a certain time *in situ*, thus allowing the poison to be absorbed; and, lastly, remedial measures are more difficult to adopt if the wound is deep.

A wound from a poisoned arrow should always be considered serious, however slight the injury may appear, and whatever part of the body is affected. Perhaps wounds of the limbs are less dangerous than most others, while wounds that affect serous membranes or vital organs are naturally graver on account of the attendant complications.

As mentioned above, the age of the poison is important; it may be old enough to be inert, or the paste may require a little time in contact with the blood and fluids of the body to be dissolved and absorbed. It may be taken for granted that no surgically clean arrow ever leaves the bowstring, so that sepsis has to be guarded against in any case.

The clinical symptoms vary considerably, as might be expected from the composite and uncertain character of the poison. Slight wounds that do not penetrate far beneath the skin generally do well, and give rise to no symptoms if treated on sound surgical lines. Deep wounds, however, are more serious, and the accompanying table, which is extracted from the medical report on the Chibbuk expedition in 1907, shows briefly the history of the 10 fatal cases which formed 20 per cent. of the total casualties on that occasion.

It will be seen that the dangerous cases arrange themselves roughly into three groups:

Group I includes those cases in which death follows rapidly (quarter of an hour to two hours) upon the injury as the direct result of the poison, or from haemorrhage. The clinical symptoms here are those of a failing heart, and it is not always easy to say whether the patient is dying from a heart poison or from internal haemorrhage.

Case.	Length of Life after being Hit.	Nature of Injury (Arrow Wounds).	Remarks.
1	½ hour	Deep wound of back	Strychnine injections probably too late. In Case 2 also tannic acid not used at once, as the soldier thought slightly of his wound.
2	½ hour	Slight wound of thigh	
3	1 hour	Right lung pierced	Arrow extracted; death from syncope.
4	1½ hours	Right lung wounded	Died almost at once on reaching hospital.
5	1 hour	Left kidney wounded	Patient brought in collapsed, and died in a few moments after admittance.
6	5 days	Perforating wound of forearm	Wound apparently clean, but cellulitis set in on the third day.
7	36 hours	Frontal sinuses pierced	Spreading cellulitis; death from meningitis; arrow extracted by patient.
8	30 hours	Deep wound of thigh	Tannic acid used early; arrow extracted by patient; cellulitis.
9	8 days	Deep wound of buttock	Tannic acid used early; tetanus supervened thirty hours before death; wound apparently healthy.
10	7 days	Forearm perforated	Tannic acid used early; incisions for cellulitis, which cleared up; tetanus supervened twenty-four hours before death.

When first seen the wounded are generally in a state of collapse, and the condition of such patients seldom warrants surgical search for internal bleeding. Diagnosis in such cases as 1 and 2, however, is not as a rule difficult. The stricken man with cold and sweat-covered skin, whose dilated pupils show no reaction, and whose pulse is slow, small, and irregular, presents a picture that is fairly easily recognizable.

Group II comprises cases in which apparently the heart poison is not at work but in which septicaemia sets in some hours or days after the injury. A certain number of cases are bound to become septic, but there are other wounds (of which Nos. 7 and 8 in the above table are instances) which apparently are aseptic in the beginning and give no cause for alarm. In those cases that end fatally there is a very rapidly-spreading oedema of the cellular tissues with high temperature, and the infection is probably erysipelatoid.

Group III contains what may be called the "convulsive" cases. Here the diagnosis is of some special interest as the spasms may be due either to tetanus or strychnine poisoning. In Cases 9 and 10 the early appearance of trismus, the tonic nature of the spasms, and the late onset of the symptoms generally, made the diagnosis of tetanus fairly certain; moreover, the samples of poison which were sent to England for analysis were declared to be free from strychnine.

The treatment of poisoned arrow wounds must necessarily be prompt, and where several cases are brought in at once the deepest wounds should receive first attention. Since promptitude is so important, and the surgeon cannot attend to each case immediately, I instruct the Europeans and the native non-commissioned officers in the principles of first aid. Each European engaged with the troops is supplied with a lancet, dressings, pure carbolic acid, and tannic acid, while each native section commander also carries a supply of tannic acid and bandages. In this way much time is saved. The procedure adopted whenever possible is as follows: A ligature is placed above the wound, which is then sucked by the wounded man himself or a comrade (the dangers of the practice are, of course, fully explained); the arrow is extracted when necessary and the wound cauterized by a glowing stick or by pure carbolic. The ligature is now removed and bleeding encouraged; finally tannic acid powder is packed into the wound and a dressing applied. In wounds of the face and other parts where ligation is not possible, manual compression should be tried and the wound excised or scraped, according to its size.

The French colonial surgeons place great reliance on tannic acid in the treatment of poisoned-arrow wounds. After using it in nearly 100 cases, I certainly think it has a curative action, provided that it is applied to the wound early enough. The exact method of its action does not seem quite clear, but possibly, besides constricting the blood vessels, it may form some insoluble or inert compound with the active agents of the poison. Clinically it is observed that the efficacy of the drug varies inversely with the depth of the wound. It may be mentioned that the native soldiers have great belief in the drug, and such faith, of course, means a great deal in the treatment of sickness.

The after-treatment of simple cases is conducted on rational lines; a brisk purge is given as soon as possible, while stimulants and light food are generally indicated for the first few days. The more serious cases will require further treatment. In the first place, I think it is always advisable, in the case of natives, to remove the arrow if it has not been already extracted by the wounded man himself. Even where the case is hopeless, the patient generally wishes to be rid of his "thorn in the flesh," and I think in such circumstances the medical officer is justified in acting in accordance with the patient's wishes, rather than in following his own surgical instinct. Where an arrow has transfixed a limb, it is often better to thread the barb right through; much time is thereby saved, as backward delivery is often difficult; moreover, better drainage is thus established.

In the heart poisoning cases hypodermic injections of strychnine are indicated, and every attempt should be made to rally the patient. Each moment is precious, and while the wound is being attended to by an assistant, the surgeon should be injecting strychnine.

Obvious puncture of a large artery calls for ligature which should be well above the level of the wound on account of the possibility of septic infection and secondary haemorrhage.

Cases of cellulitis require early and extensive incisions and generally prove very troublesome amid the rough and ready conditions of bush practice. A point worth remembering in such cases is, that baths, whether for the whole body or for the local treatment of wounded limbs, can be easily extemporized by excavating the ground and lining the cavities with waterproof sheeting.

It is best to isolate convulsive cases in some quiet part of the camp. The strychnine cases should be treated with the ordinary antidotes, but the tetanus cases do not seem very amenable to treatment. Chloroform and morphine would seem to be the only remedies as far as symptomatic treatment is concerned. The latter drug should be pushed and feeding conducted by enemas. In the absence of any antitoxin nothing more can be done beyond keeping up the patient's strength, and relieving distress.

In the general treatment of wounded soldiers in bush fighting it is well to remember one or two points. All wounds, of course, must be treated on strict antiseptic lines, though it must be admitted that compliance with these ideals is not always easy. Beds are very rarely available on active service, but it is important that patients with wounds should not lie on the bare ground, and native mats or ground sheets are generally available. Shade will be essential, and protection against dust storms and rains must be ensured. The water supply will need careful attention, and drinking water should be boiled before use. The food difficulty will arise quite early, and since the soldier's wife does not accompany him, other arrangements will have to be made. These, of course, will depend entirely upon local conditions, but, in any case, the medical officer will be amply repaid for any trouble he may take over the material comforts of his patients.

No real remedy for arrow poisons appears to exist among the natives themselves. Charms, of course, are popular, and they generally consist of small portions of a Koran bound up in leather, but almost any small article may be considered as a *ju-ju* according to the faith of the wearer.

AT a recent meeting of the Zoological Society of London a paper by Dr. A. E. Brown, Secretary of the Zoological Society of Philadelphia, was read on the tuberculin test in monkeys. The paper described experiments recently carried out with a view of suppressing tuberculosis in monkeys. At the same meeting Professor E. A. Minchin read a paper on the flagellates parasitic in the blood of fresh-water fishes, in which five species of *Trypanosoma* and four species (two new) of *Trypanoplasma*, from fishes of the Norfolk Broads, were described in detail. Particular attention was paid to the minute structure of the parasites, and it was shown that it is possible to give a uniform description of the nuclear apparatus of both *Trypanosoma* and *Trypanoplasma*.